Power Electronics - I
(New) (1210)

P. Pages : 2

Time : Three Hours   Max. Marks : 100

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory an carry equal marks.
5. Assume suitable data if necessary.
6. Use non-programmable calculator is allowed.

1.   Attempt **any two.**

     a)   What is commutation ? Explain class D type of commutation method in details with circuit diagram and waveforms.   **10**

     b)   Draw and explain construction of IGBT and explain it's V-1 characteristics.   **10**

     c)   Explain working of GTO. Also derive,

$$B_{off} = \frac{\alpha_2}{\alpha_1 + \alpha_2 - 1}$$

     10

2.   Attempt **any two.**

     a)   A $1-\phi$ semiconverter is connected to 120V, 60Hz supply. The load current is 12A can be assumed to be continuous and ripple free. If delay angle $\alpha = \pi / 2$ then calculate :   **10**

         i) V_{dc} ii) V_{rms}
         iii)   D. F.   iv)   P.F.

     b)   Draw and explain circuit diagram and wave froms for $3 - \phi$

     semiconverter with R - load for $\alpha = 60°$ and derive an expression for average output voltage.   **10**

c) Explain the effect of self or source inductance on performance of $1-\phi$ full converter with circuit diagram and waveform and also derive equation for V_{dc}.   **10**

3.   Attempt **any two.**

a) In step up converter, duty ratio is adjusted to regulate output voltage $v_o = V_o$ at 48 V. The input voltage is varries from 12 to 36V. The maximum output power is 120 w for the stability purpose the converter is operated in discontinuous current conduction mode. If $F_s = 50$ kHz, $R = 10\Omega$, $C = 470\,\mu F$. Assuming ideal components. Calculates maximum value of L & peak to peak ripple in output voltage.   **10**

b) Explain the operation of step down converter for dissontinuous conduction mode with V_o is kept constant.   **10**

c) Explain the operation of SMPS with detail block diagram & write down it's advantages and applications.   **10**

4.   Attempt **any two.**

a) Draw and explain parallel inverter circuit diagram with it's waveforms.   **10**

b) Explain the operation of full bridge inverter with unipolar voltage switching.   **10**

c) Explain the working of $3-\phi$ squre wave VSI for $120°$ conduction mode of conduction also draw it's output phase and line voltage waveforms.   **10**

5.   Attempt **any two.**

a) Explain SLR dc - dc converter half bridge circuit for discontinuous mode of operation.   **10**

b) Explain class E converter with neat circuit diagram and waveforms for optimum and non-optimum mode. Give it's advantage and disadvantages.   **10**

c) Explain the operation of ZVS resonant switch converter in detail with neat circuit diagram and waveforms.   **10**

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